

Porcupine quills in raccoons as an indicator of rabies, distemper, or both diseases: Disease management implications

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Abstract — A relationship was detected between the presence of embedded porcupine quills and the diagnosis of rabies in raccoons in eastern Canada during 1999–2004. No relationship was found between the presence of quills in raccoons and the diagnosis of canine distemper. Raccoons with embedded quills should be submitted for rabies testing.

Résumé — Piquants de porc-épic comme indicateurs de rage, de maladie de Carré ou des 2 maladies chez le raton laveur : conséquences dans la gestion des maladies. Une relation a été dépistée entre la présence de piquants de porcs-épics incrustés et le diagnostic de rage chez les ratons laveurs de l'est du Canada entre 1999 et 2004. Aucune relation n'a été trouvée entre la présence de piquants chez les ratons laveurs et le diagnostic de maladie de Carré. Les ratons laveurs portant des piquants de porcs-épics incrustés devraient être contrôlés pour la rage.

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The arctic variant of rabies has been present in Ontario since the mid 1950s, with more than 56 000 cases being reported to 2006 (1,2). In addition, the raccoon variant of rabies has been present in Ontario since July 1999, with 132 cases confirmed as of February 2006 (3,4). Rabies control efforts in Ontario have diminished the number of rabies cases (both variants), so detection of new cases requires effective surveillance. Raccoons (*Procyon lotor*) accounted for 98.5% (130/132) of the diagnosed raccoon variant cases in Ontario and the behaviors, conditions, or both, of those rabid animals included aggression, fighting with dogs, ataxia, vocalizations, sick appearance, and the presence of porcupine (*Erethizon dorsatum*) quills (2).

In Ontario, canine distemper is quite prevalent in raccoon populations (5,6), and infected raccoons may exhibit signs similar to those in raccoons with clinical rabies (7–9). The similarity



Figure 1. A raccoon (*Procyon lotor*) head with embedded quills.

of signs for these 2 diseases can complicate decisions involving surveillance programs designed to detect rabies when it first enters an area, especially Ontario, where the disease has been controlled (4). The objective of this study was to determine if there was a relationship between the presence of quills embedded in raccoons and the diagnosis of rabies or distemper.

Historically, in Ontario, if a rabies vector species, such as a fox, displayed embedded porcupine quills, it was usually suspected of being infected with the arctic variant of the rabies virus. In fact, Johnston and Beauregard (10) reported that 34% of a sample of rabid foxes (*Vulpes vulpes*) in Ontario had porcupine quills in the muzzle. Quills were also found in 13% of raccoons that were positive for the raccoon variant of the rabies virus in Ontario during 1999–2003 (2) (Figure 1). However,

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data collated by staff at the Canadian Food Inspection Agency (CFIA), Nepean, Ontario, proved that raccoons with quills were not always rabies positive. Beginning in 1992, a sample (3008) of raccoons that were submitted to the CFIA laboratory in Nepean for rabies diagnosis was also screened for the presence of distemper viral antigen. The submission forms for 1079 of those specimens that were submitted by the public during 1999 to 2004 (87.5% from Ontario [50% from eastern Ontario], 5.7% from Quebec, 6.6% from New Brunswick) were examined to determine if porcupine quills were noted in the specimens. Of the 1079 submissions, 1038 (96%) were negative for rabies virus (3 had quills) and 41 (4%) were positive for rabies virus (5 had quills). Of the rabies positive raccoons, 22 were from Ontario and 19 from New Brunswick. Analysis of these data revealed a relationship between the presence of quills and the diagnosis of rabies — greater numbers of rabid raccoons than non-rabid raccoons had quills (chi square = 75.97, $P < 0.00001$). Of the 1079 submissions, 328 (30.4%) were positive for *Canine Distemper Virus* (CDV) (2 with quills) and 751 were negative for CDV (6 with quills). On a provincial basis, the prevalence of CDV in sampled raccoons was 30.7% (290/946) in Ontario, 58% (36/62) in Quebec, and 3% (2/71) in New Brunswick. No relationship could be detected between the presence of quills in raccoons and the diagnosis of CDV infection (chi square = 0.11, $P = 0.739$). Of the 8 records that indicated the presence of quills in raccoons (5 from New Brunswick and 3 from Ontario), 3 were negative for CDV and positive for rabies virus, 2 were negative for CDV and negative for rabies virus, 1 was positive for CDV and negative for rabies virus, and 1 was positive for CDV and rabies virus.

In addition, a juvenile female raccoon acquired in eastern Ontario and submitted for rabies testing in October 2003 exhibited the classical signs of rabies, including aggression (fought with a dog), activity during daytime, found close to a residential home and humans, and with porcupine quills embedded in its snout and mouth. This animal tested negative for rabies virus (fluorescent antibody test), but a diagnosis of CDV infection was later confirmed at the Canadian Cooperative Wildlife Health Centre, Guelph (based on the pattern of lung lesions and histology showing marked interstitial inflammation with syncytial giant cells containing syncytia). This animal also had a large number of nematodes (*Baylisascaris* sp.) in the lower digestive tract (11).

The similarity of signs and conditions of clinical rabies and canine distemper in raccoons, especially embedded porcupine quills, makes it very difficult to decide whether or not to submit animals for testing for rabies virus in areas where rabies is assumed to be absent or is under control. Since specimens are often not submitted for testing for rabies virus if distemper is suspected, rabies could go undetected or become well established in an area due to the complacency that distem-

per is likely the cause of animals with clinical signs being present in an area. To maximize the detection of rabies in areas where distemper might be prevalent, frequent sampling and testing for rabies virus of animals showing clinical signs, including those with quills, should occur to ensure that the rabies virus has not been introduced to the area. If the cost of doing this is prohibitive, at least animals in close proximity to rabies cases should be sampled and tested. The similarity of the clinical signs of the 2 diseases in raccoons will make it difficult for jurisdictions to detect rabies cases through the surveillance of animals showing clinical signs. If a raccoon has embedded quills, it is recommended that it be submitted for testing for rabies virus, as, in this study, 5 of 8 raccoons with embedded quills were positive for the virus.

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